still, for there come times when one partner in such an enterprise cannot advance without the other. No wonder the book stopped at the end of the first volume.

For many years Tait was the general secretary of the Royal Society of Edinburgh, and of the 365 papers, the titles of which are enumerated in Dr. Knott's bibliography, by far the greater number were communications to the society's Proceedings or Transactions. Unlike most secretaries of learned societies, he was himself the most prolific contributor.

He never joined the Royal Society of London, though he was a royal medallist in 1886, and was often asked to allow his name to be submitted. Indeed, his heart was in Edinburgh and his work there. For the last twenty-five years of his life he never crossed the Tweed; the only occasions on which he left the city were his visits to St. Andrews, ten days in spring and six weeks in autumn, with one exception, when he went to Glasgow to deliver a lecture on thunderstorms.

Though not himself a great golfer, he was the recognised authority on the physics of the game. His explanations of the "carry" of a golf ball, of the action of toeing, heeling and slicing, all examples of his theory of the effect of spin, stood the severe test of his own experiments, and are beyond cavil. His papers on this subject—in NATURE and elsewhere—would form an interesting book on the dynamics of a spherical projectile in air, if they were collected.

Failing health, and the death of his son, Lieut. F. G. Tait, the great amateur golfer, at Koodoosberg in 1900, brought the toil of his strenuous life to a close. But at the last, only two days before his death, he was busy with his beloved quaternions, and wrote a sheet of notes of investigations on the linear vector function.

This notice is already too long, and yet nothing has been said of Tait's work on thermoelectricity, on mirage, or of "The Unseen Universe," and the "Paradoxical Philosophy." The two last-mentioned works, written in conjunction with Balfour Stewart, are interesting as an attempt to apply the principle of continuity to infer, and to some extent explain, the existence of an unseen system of things to which in some sort we stand in physical relation. Incidentally they show the strong yet unobtrusive religious faith of their authors. A. G.

AUSTRALIAN PLANTS.

Australian Plants Suitable for Gardens, Parks, Timber Reserves, &c. By W. R. Guilfoyle. Pp. 478. (Melbourne and London: Whitcombe and Tombs, Ltd., n.d.) Price 15*s.* net.

THIS work, prepared, as we learn, at the request of a special committee, embodies the practical experience of its author during the past thirty-six years. Except for some five-and-twenty pages of preliminary matter, the book is not one that admits of being read. But this fact in no way detracts from its merits as a work of reference, or lessens the debt to Mr. Guilfoyle of Australians who care either for gardening or for Australian plants. The feeling, its author explains, which has inspired its publication, is a desire to arouse increased enthusiasm in regard to the native species. The introduction should at any rate have the effect of directing the attention of his compatriots to the fact that Australia is richly endowed with what is wonderful and beautiful in the vegetable kingdom. If it does have this effect, it will have well served its purpose, since all that can be needed to evoke the enthusiasm which is desired is some intelligent attention to the plants themselves.

Granted the existence of such enthusiasm the work before us must prove invaluable in guiding and controlling it. That some control will be needed an examination of Mr. Guilfoyle's lists abundantly shows. The value of the lists for this purpose is enhanced by the self-restraint which has enabled the author to confine to a couple of lines references to individual plants which those who are not themselves Australians would gladly have seen expanded to as many pages.

It is scarcely strange that the inhabitants of an autonomous State like the Australian Commonwealth should be less enthusiastic over their native plants than the inhabitants of Britain. The wattles and gums, the myrtles and honeysuckle trees, the Boronias, Brachycomes, and Epacrids of Australia do not yet arouse feelings and memories so keen as those aroused by the oak and thorn and gorse, the primrose or the daisy or the heather of Britain. There is, however, more than the mere absence of literary allusion or historical association to account for the fact. In Australia the number of forms capable of awakening interest or provoking admiration is so immeasurably greater than in Britain that the observer's attention is distracted. Even where, in spite of greater or less botanical differences, the plant-forms of the two countries are sufficiently alike to be comparable from an æsthetic point of view, as, for example, in the case of the Epacrids or Australian heaths and our familiar ling, the manifest superiority of the Australian plants scarcely suffices to produce the expected effect. Perhaps the fact that the enthusiasm of the Australian has to be extended to a dozen different forms, while we can concentrate ours on one or two, may be some explanation. Should Mr. Guilfoyle's own enthusiasm enable his fellow-countrymen to overcome this difficulty, he may truly be said to have deserved well of the Commonwealth.

The attempt made in a special list to bring some order out of the chaos which prevails in respect of the common names applied to Australian Eucalypts in different parts of the country, deserves especial attention. How great the prevailing confusion is will be readily appreciated if the Eucalyptus names recorded in Mr. Gerth van Wijks's "Dictionary" be examined. Mr. Guilfoyle's courage in endeavouring to deal with this troublesome question compels our admiration. It is perhaps too much to expect that everyone all over Australia will be willing to abandon the use of names to which they personally have become accustomed, and to be guided by what, after all, must at best be a somewhat eclectic set of substitutes. But if in this particular matter it can scarcely be hoped that Mr. Guilfoyle's action will receive the universal approval

of his own generation, there is no doubt that some such action, if only on grounds of public convenience, is necessary, and it is more than probable that Australians of another generation will be grateful for the prescription of a stereotyped list of names.

THE CHEMISTRY OF CALCAREOUS CEMENTS.

The Chemistry of Testing of Cement. By Dr. C. H. Desch. Pp. xi+267. (London: E. Arnold, 1911.) Price 10*s.* 6*d.* net.

THE "cement" treated of in this volume is the group of calcareous cements—that is, the plastic materials employed to produce adhesion between stones and bricks in the construction of buildings and engineering works. The book deals, shortly but clearly, with the manufacture of the various kinds of calcareous cements, with their components, constitution, and properties, and with the mechanical and chemical methods of testing them.

Owing to the extending employment of concrete the production of cement is becoming more and more important, and the demands upon its qualities increasingly stringent. These more exacting requirements have so far been met with a remarkable degree of success, partly by improvements in mechanical processes, but also to no small extent through the cooperation of the chemist. For two reasons the services of the latter are likely to become of yet greater value in the industry. On one hand a still higher standard of quality may be demanded in the finished product, and, on the other, a larger variety of raw materials may be found to be utilisable in the production.

The complex character of the substances entering into the composition of calcareous cements, and the obstacles in the way of ready experiment with the products, have in the past greatly limited our knowledge of the chemical reactions which occur in the making and "setting" of these bodies. In modern practice, however, two things are helping to shed light upon the dark places. One is the introduction of "etching" methods, similar to those employed in metallography, for studying the structure of cements in their various phases; the other is the conception of cements as, essentially, colloids. Both these matters are fully explained and their importance emphasised in the volume before us.

The view adopted by the author as to what takes place during the setting of Portland cement is substantially that of Dr. Michaëlis. Assuming for the purpose of discussion that the cement materials consist of lime, alumina, and silica only, then the essential hydraulic constituent, alite, is formed from these by the action of heat during the process of manufacture. It is regarded as a solid solution of calcium silicates and aluminates. When water is added to the cement, it partly decomposes the alite, hydrolysing the aluminates in the first instance. The solution thus produced is a supersaturated one, and it presently deposits tricalcium aluminate. According to the quantity of water in the mixture, the deposit is either mainly colloidal or mainly crystalline; if the proportion of water is small it favours the production of a colloidal "gel." The excess of lime above that required for tricalcium aluminate remains in solution, or a part may be deposited as crystals of calcium hydroxide. This process is regarded as probably corresponding with the "initial set" of the cement.

As regards the subsequent gradual hardening, the argument is that water acts much more slowly on the calcium silicate contained in alite than on the aluminates, but when hydrolysis does occur the calcium silicate separates out in the colloidal form. The gel thus produced forms a coating round the cement particles, protecting them from further direct action of the water. But as the latter slowly diffuses through the colloidal coating, more and more of the alite is slowly hydrolysed, and the lime set free is absorbed by the gel, which thereby increases gradually in density and hardness, and loses its plastic qualities. To this gradual desiccation of the gel, which takes place even when the cement is immersed in water, is due the eventual hardening of the mass.

Evidence for the actual existence of colloid products in hardened cements is found in the fact that some of the components can be stained with eosin. Etching with acids shows the structure of the unchanged cement in the interior of the particles, around and between which lies the dyed colloidal gel.

The volume embodies the chief results of modern inquiries into what is admittedly a difficult subject. It is written in a true scientific spirit, and would be an excellent book to place in the hands of a chemist with progressive ideas, who wishes to study carefully the chemistry of calcareous cements. C. S.

GEOPHYSICS.

Physik der Erde. By Prof. M. P. Rudzki. Pp. viii+584. (Leipzig: Chr. Herm. Tauchnitz, 1911.) Price 14 marks.

THE course of lectures at the University of Cracow published by Dr. Rudzki in the book under review covers a wide range. The subject-matter lies on the border-line of astronomy, mathematics, geography, and geology, and the lectures have coordinated these different sciences very successfully. By readers in this country, where specialised studies so largely cramp workers into one narrow domain, the book should be greatly appreciated. It is much to be desired that more opportunity could be found for similar work in British educational methods; for those who agree with this view Dr. Rudzki's work will prove a useful stimulus.

In saying that the lectures have successfully coordinated the different subjects represented, the reviewer does not wish to suggest that the treatment is necessarily the happiest from the point of view of a student in this country. For instance, while the mathematical reader will find much to interest him and very little that he cannot follow in the subjects outside his own domain, he will find the mathematical part of the work occasionally incomplete or sketchy. At the same time the reader who is not a professed mathematician must frequently find the mathematics